

CLAIMS

1. A control system for an electrical substation for transmission and distribution of electrical energy comprising equipment for control, measurement, monitoring and protection of the substation, and I/O means for communicating measurements and signals and bus means for transferring measurements and/or signals between transmission and distribution equipment and control, measurement, monitoring and protection equipment,

wherein said measurements and signals are transferred between the I/O means and the control, measurement, monitoring and protection means by means of a common bus by means of which software modules for control, regulation and protection of said substation have real time access to said measurements and signals.

2. A control system for an electrical substation according to claim 1, wherein in-signals are arranged transferrable via the I/O means and functions of control, protection and monitoring implemented as software modules in substantially one computer.

3. A control system for an electrical substation according to claim 1, wherein out-signals and/or maneuver instructions are arranged transferrable via the I/O means from functions of control, protection and monitoring implemented as software modules substantially in one computer.

4. A control system for an electrical substation according to claim 1, wherein a control and protection function includes software modules providing the operation of any or all of DC Protection, AC Protection, Pole Control, Converter Firing Control running at the same time and substantially in one computer.

5. A control system for an electrical substation according to claim 1, wherein one or more functions for maintenance is provided and arranged suitably with access to real time values via a bus means.

5

6. A control system for an electrical substation according to claim 5, wherein the one or more functions provided for maintenance are arranged suitably with access to stored historical values and measurements from design, test and service operations of the substation control system.

10

7. A control system for an electrical substation according to claim 1, wherein the one or more functions for control, operation or maintenance are provided with a software simulation program means arranged suitably with access to stored historical values and measurements from design, test and operation the substation control system.

15

15

15

20

8. A control system for an electrical substation according to claim 1, wherein an I/O means of the substation comprises one or more high speed Time Division Multiplexed (TDM) buses.

20

9. A control system for an electrical substation according to claim 8, wherein an I/O means of the substation comprises one or more a buses of type Control Area Network according to ISO standard 11898. Q.

25

25

10. A control system for an electrical substation according to claim 8, wherein an I/O means of the substation comprises on or more Digital Signal Processors (DSP).

30

11. A control system for an electrical substation according to claim 8, wherein a Human Machine Interface is provided equipped with schematic representations of lines such that real time values may be displayed on request for parts or components of said lines.

5

12. A control system for an electrical substation according to claim 8, wherein a Human Machine Interface is provided equipped with schematic representations of circuits such that real time values may be displayed on request for parts or components of said circuits.

10

13. A method to control a substation for the transmission and/or distribution of electrical power, by means of making measurements and registering one or more operational states, generating in-signals dependent on measurements and states of the transmission and/or distribution process, accessing set values, making comparisons between set values said measurements and states, and generating out-signals in dependence on those comparisons, wherein the method includes the steps of:

-receiving in-signals from a plurality of measuring instruments to an I/O means,

-transferring the in-signals via the I/O means to a bus means,

-receiving the in-signals via the bus means via a bus of a computer,

-sending out signals and/or maneuver instructions from the computer to the process of the substation via the bus means and an I/O means.

14. A method to control a substation for the transmission and/or distribution of electrical power according to claim 13, wherein

- in-signals are sampled,
- states of equipment are sampled,

30

- set values are accessed and compared to in-signals and/or states,
- comparisons are made and monitoring out-signals and condition states are generated.

5 15. A method to control a substation for the transmission and/or distribution of electrical power according to claim 13, wherein

- in-signals are sampled,
- states of equipment are sampled,
- set values are accessed and compared to in-signals and/or states,

10 -comparisons are made and out-signals, maneuver instructions and states are generated to regulate a part of the process in the substation.

16. A method to control a substation for the transmission and/or distribution of electrical power according to claim 13, wherein

- in-signals are sampled,
- states of equipment are sampled,
- set values are accessed and compared to in-signals and/or states,
- comparisons are made and out-signals and condition states are

20 generated to provide information for a maintenance function for a part of the substation.

17. A method to control a substation for the transmission and/or distribution of electrical power according to claim 13, wherein

25 said substation control system is operated by making selections from a graphical representation on a screen display means of any of:

- a computer connected by a LAN network to the control system;
- a computer connected by a WAN network to the control system;

30 -a computer connected by a telephone network to the control system;

-a computer connected by a short range radio link to the control system;

-a mobile telephone connected by a telephone network to the control system; or

5 -a mobile telephone connected by a short range radio link to the process system.

10 18. Use of a system according to claim 1 to provide a control function for a substation of a power transmission and distribution system.

15 19. Use of a system according to claim 1 to provide a protection function to a substation of a power transmission and distribution systems.

20 20. Use of a system according to claim 1 to provide a maintenance function for a substation of a power transmission and distribution system.

25 21. Use of a control system for a substation according to claim 1 to provide a condition monitoring system to monitor the condition high voltage DC converter station.

30 22. Use of a system according to claim 1 to provide control functions for a power transmission and distribution system associated with any type of electrical generating plant as diverse as a wind power generator, a windfarm, a tidal power plant, a fuel cell, a combined generation and storage plant.

35 23. Use of a system according to claim 1 to provide control functions for a power transmission and distribution system associated with any type of industrial plant as diverse as plants

such as an airport, a hospital, a paper mill, a petroleum refinery or a vehicle assembly plant.

24. A computer program product comprising computer code means or software code portions for enabling a computer or a processor to carry out the steps of any of the methods according to claim 13,

25. The computer program product of claim 24, wherein the computer code means or software code portions comprise executable parts formed written in as one or more object oriented programs and accessible and implementable over a network such as the Internet.

26. A computer program contained in a computer readable medium, comprising computer program code means to make a computer or processor carry out the steps of a method according to claim 13,